

Worksheet 2015-11 EG-00005(1)

(1) Calculate the equation of the following straight lines:

(a) through the points $(1; 6)$ and $(3; 6)$

$$y = 6$$

$$\text{or } m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 6}{3 - 1} \\ = \frac{0}{2} = 0$$

$$\therefore y - y_1 = m(x - x_1)$$

$$y - 6 = 0(x - 1)$$

$$y = 6$$

(b) through the points $(-2; 6)$ and $(3; 4)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \\ = \frac{4 - 6}{3 - (-2)}$$

$$m = \frac{-2}{5} = -\frac{2}{5}$$

$$\therefore y - y_1 = m(x - x_1)$$

$$y - 6 = -\frac{2}{5}(x - (-2))$$

$$y - 6 = -\frac{2}{5}(x + 2)$$

$$y - 6 = -\frac{2}{5}x - \frac{4}{5}$$

$$y = -\frac{2}{5}x + \frac{26}{5}$$

(c) through the point $(5; 0)$ perpendicular to the line $y - x - 7 = 0$

$$y = x + 7 \quad \therefore m_1 = 1$$

$$\therefore m_2 = -1 \quad (m_1 \times m_2 = -1) \text{ through } (x_1, y_1) = (5, 0)$$

$$y - y_1 = m(x - x_1)$$

$$y - 0 = -1(x - 5)$$

$$y = -x + 5$$

(d) through the origin and parallel to the $4 + 3x = y$

$$y = 3x + 4$$

$$\therefore m_1 = 3$$

$$\therefore m_2 = 3 \quad (m_1 = m_2) \text{ through } (0; 0) \xrightarrow{c}$$

$$y - y_1 = m(x - x_1)$$

$$y - 0 = 3(x - 0)$$

$$y = 3x$$

$$\text{or } y = mx + c$$

$$y = 3x + 0$$

(2) $A(-4; 4)$, $B(2; 6)$ and $C(0; -4)$ are the vertices of ΔABC .

(a) Calculate the coordinates of E and F, the mid-points of respectively AB and BC.

(b) Determine the equations of the medians AF and CE.

[A median is the line between the vertex of a triangle and the mid-point of the opposite side of the same triangle.]

(c) Calculate the coordinates of S, the point of intersection between AF and CE.

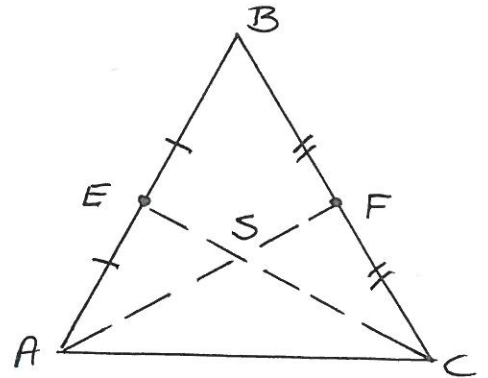
(a) $A(-4; 4)$ and $B(2; 6)$

$$E = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left(\frac{-4 + 2}{2}, \frac{4 + 6}{2} \right)$$

$$= \left(\frac{-2}{2}, \frac{10}{2} \right)$$

$$E = (-1; 5)$$



$B(2; 6)$ and $C(0; -4)$

$$F = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left(\frac{2 + 0}{2}, \frac{6 - 4}{2} \right)$$

$$F = (1; 1)$$

(b) AF: $A(-4; 4)$ and $F(1; 1)$

$$m_{AF} = \frac{1 - 4}{1 - (-4)} = \frac{-3}{5}$$

$$\therefore y - y_1 = m(x - x_1)$$

$$y - 1 = \frac{-3}{5}(x - 1)$$

$$y - 1 = -\frac{3}{5}x + \frac{3}{5}$$

$$y = -\frac{3}{5}x + 1\frac{3}{5}$$

CE: $C(0; -4)$ and $E(-1; 5)$

$$m_{CE} = \frac{5 - (-4)}{-1 - 0} = \frac{9}{-1} = -9$$

$$\therefore y = mx + c$$

$$\therefore y = -9x - 4$$

(c) $y = -\frac{3}{5}x + \frac{8}{5}$ and $y = -9x - 4$

$$\therefore -\frac{3}{5}x + \frac{8}{5} = -9x - 4$$

$$-3x + 8 = -45x - 20$$

$$-3x + 45x = -20 - 8$$

$$42x = -28$$

$$x = \frac{-28}{42}$$

$$x = -\frac{2}{3}$$

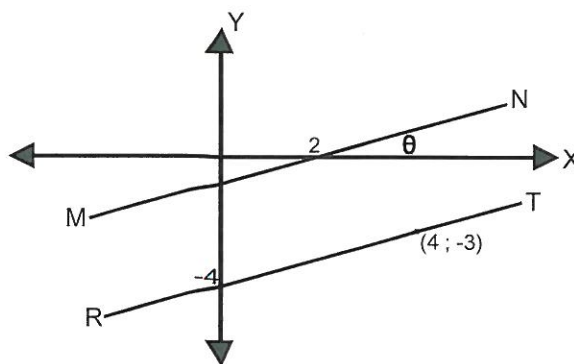
$$\therefore y = -9\left(-\frac{2}{3}\right) - 4$$

$$= 6 - 4$$

$$= 2$$

$$\therefore S\left(-\frac{2}{3}; 2\right)$$

(3) $MN \parallel RT$ in the diagram.



(a) Calculate the equation of line RT.

(b) Calculate the equation of line MN.

(c) Calculate θ .

[Correct to 2 decimals.]

(a) RT: through $(0; -4)$ and $(4; -3)$

$$m_{RT} = \frac{-3 - (-4)}{4 - 0} = \frac{1}{4}$$

$$\therefore y = mx + c$$

$$y = \frac{1}{4}x - 4$$

(b) $MN \parallel RT \rightarrow \therefore m_{NM} = m_{RT}$

$\therefore m_{NM} = \frac{1}{4}$ through $(2; 0)$

$$\therefore y - y_1 = m(x - x_1)$$

$$y - 0 = \frac{1}{4}(x - 2)$$

$$y = \frac{1}{4}x - \frac{1}{2}$$

(c) $\tan \theta = m$

$$\tan \theta = \frac{1}{4}$$

$$\therefore \theta \approx 14.04^\circ$$